Methodology for Derivation of C2 and ISR Requirements

Mr. B. Retzuis
NATO C3 Agency
P.O. Box 174, 2501 CD The Hague
NETHERLANDS

Birger.retziues@nc3a.nato.int / Paolo.bartolomasi@nc3a.nato.int
Kurt.veum@nc3a.nato.int / Niels.aarup@nc3a.nato.int

1.0 INTRODUCTION

The complex challenges posed by the future security environment calls for a systematic method for planning under uncertainty with the aim of providing the capabilities required to achieve the range of objectives/effects needed to successfully accomplish NATO's missions and aims. This capability based planning needs to be enhanced and applied more widely within NATO Defence Planning (DP). Furthermore, capability requirements should be identified in a manner that is traceable and transparent and one that facilitates the timely and efficient development of solutions to meet these requirements.

Addressing these challenges will also require a Comprehensive Approach focussed on the achievement of objectives/effects through a coordinated use of the Alliance's Political, Military, Economic and Civil instruments of power. It will also often require the Alliance to operate as part of a wider Coalition. Consequently, achieving the required objective/effects will often necessitate the coordinated action of many disparate entities within and between organizations. These organizations may be military and non-military. They may be NATO organizations or organizations from member nations. They may also be organizations from non-NATO nations, International Organizations (IO) such as the UN and Non-Governmental Organizations (NGO). Coordinated action will require effective Command and Control (C2), Intelligence, Surveillance and Reconnaissance (ISR) and interoperability between the entities involved in C2 and ISR will be critical. This in turn will require timely exchange of relevant information. A structured, systematic method to defining this information sharing is critical.

The complexity and uncertainty outlined above means that interoperability will often need to be achieved on an ad-hoc basis. The manner in which interoperability is achieved therefore needs to be flexible and adaptive. Such flexibility and adaptability is achieved by applying a service oriented approach to developing solutions to interoperability at the organizational and system level.

The key to deriving robust C2 and ISR capabilities and associated interoperability is to separate 'what needs to be delivered' (i.e., the capability requirements) from 'how it is delivered' (the solution/technology). To do this one needs to introduce the concept of 'service[1] provision'. This entails specifying the 'requester' for a task to be performed and a 'provider' who commits to performing the task. An example of a requester may be a HQ and the provider may be a subordinate unit or another HQ. This illustrates that a request may be a tasking with an obligation to deliver, or a request that can be negotiated and potentially denied. This is the essence of the service oriented approach.

The service oriented approach is a natural complement to capability based planning. Furthermore the service oriented approach emphasizes the description of how the elements within a system/organization interrelate and interact to perform tasks and hence achieve required objectives and effects. Such interrelation and interaction is the core element of architecture definition. The generation of architectures is therefore intrinsic to this service orientated approach.

[1] Service: A type of delivered functionality, specified independently of the capabilities that provide it (NAF v3.0).

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This paper outlines how a service oriented approach could be applied to support the generation of C2 and ISR capabilities and associated interoperability in the context of the NATO Defence Planning Process (NDPP). This results in a clear, auditable trail from the strategic missions that NATO must be able to undertake through to the C2 and ISR capabilities needed to perform these missions. The approach provides a systematic way for deriving a comprehensive set of requirements, is scalable and adjustable to the problem at hand, and has broad applicability. Its application entails the collaboration of different stakeholders from the operational and technical community.

1.1 The Methodology

The methodology for derivation of C2 and ISR requirements is outlined in the following figure and containing 6 basic steps.

1. **Identify operational context:** The aim in this step is to describe the operational context and the set of tasks (operational activities) relating to planning, execution and assessment that need to be undertaken within a Mission Type (MT). The NATO MTs and associated Planning Situations used in Defence Planning provide the basis for describing the operational context. The operational context includes operational activities that need to be performed in order to accomplish the Mission, the operational activities require a 'requester' and 'provider'. The Defence Planning Mission Task Decomposition (MTD) provides the basis for identifying the operational activities.

2. **Define operational activities:** The aim of this step is to further develop the operational activities identified in step 1 by defining the objective/effect to be achieved, conditions and constraints on achieving the objective/effect and the required Quality of Operation (QoO). QoO is a collection of operational attributes concerned with how well (performance metrics) the operational activity needs to be performed. Requirements are stated in a solution independent manner.

3. **Design operational activity:** In this step different solutions are designed/analyzed in order to identify which of them meets the requirements established in the previous step. The design is based on solution elements (e.g., HQ, Air/Land/Maritime units and non-military elements) and specifies their functions and how they generally need to interact. Depending on the nature of the problem and the time horizon under consideration, solution elements may be highly specific (e.g., specific system) or more generic. These solution elements will ultimately be provided by Alliance member nations or NATO.

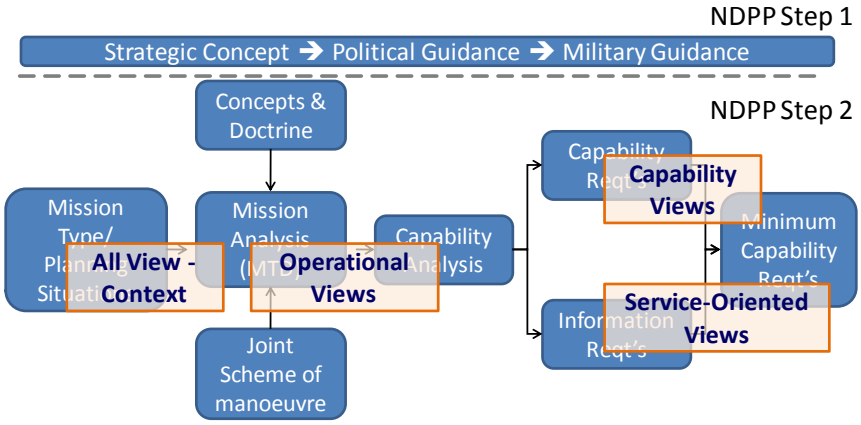
4. **Determine collaboration between solution elements:** This step determines how the solution elements identified in step 3 collaborate and identifies the classes of information products that each solution element needs to produce and utilize to enable such collaboration.
5. **Define User Information Services:** "User Information Service (UIS)" is the delivery of information to a user in order to fulfil that user's information requirements. The aim of this step is to identify the UISs that each solution element identified in step 4 must provide, such that the operational activities identified in step 1 can be provided. The specific information products required to enable the collaboration identified in step 4 are identified for each solution element.
6. **Define NNEC Technical Services:** The NNEC Technical Services (NTS) captures which technical services need to be implemented in order to support the UISs identified in step 5. Standards from NATO and civilian standardization organizations should, to the maximum extent be used.

1.2 Use of Architectures

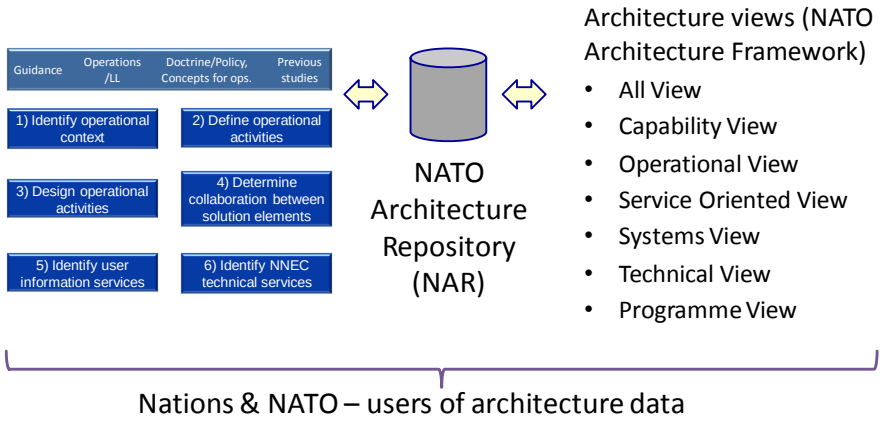
Information generated or identified by applying the methodology populates architectures as appropriate. As noted earlier architectures describe how elements within a system/organization interrelate and interact and can therefore be used to link in a readily understandable, transparent and traceable manner, operational activities identified in step 1 to NNEC Technical Services (NTS) identified in step 6. The NATO Architecture Framework (NAF) v3.0 identifies a total of 7 different types of views, each consisting of a set of sub-views that can be used to present (communicate) the information generated by applying the methodology:

- NATO All View;
- NATO Capability View;
- NATO Operational View;
- NATO Service Oriented View;
- NATO Systems View;
- NATO Technical View;
- NATO Programme View.

The figure below shows how various architecture views map onto the sub-processes in the NDPP. These architectural views support the development of capabilities, interoperability, NNEC implementation and documentation.



In order to be able to effectively share the architecture data, the architecture data needs to be stored in the NATO Architecture Repository (NAR) following an agreed set of 'rules' as laid out in the NATO Meta Model (NMM)[2]. The architecture views can then be generated and communicated as required.



1.3 Summary/Conclusion

Applying the methodology outlined in this paper ensures that a consistent operational context is used for C2 and ISR capability development. The methodology will support the NDPP in generating a consistent set of C2 and ISR related NATO Defence Planning Targets for both NATO and member nations, and hence will support interoperability.

[2] Described in the NAF.